

U.S. Serial No. 10/089,310  
Reply to Office Action of: August 10, 2004  
Family Number: P1999S008

Page 5

### REMARKS

The present invention is directed to the discovery of a jet fuel comprising more than 75 vol% of a kerosine fraction boiling in the range of 140°C to 250°C and a minor amount of a naphtha fraction made by catalytic cracking of a heavy gas oil (HCCN) which has a distillation range of  $T_5 = 165^\circ\text{C}$  to  $T_{90} = 210^\circ\text{C}$ , and an aromatic content of at least 50 vol% such that upon blending the resultant jet fuel blend has a freezing point lower than that of the kerosine prior to the blending, the total aromatic content of the blend being in the range of 15-25 vol% of the total blend.

The Examiner objected to claims 4-8 as being in improper form because multiple dependent claims cannot themselves be dependent on other multiple dependent claims.

Claims 4 to 8 have been amended to correct this defect.

New claims 9-16 are presented directed to a method for producing a jet fuel blend having a freezing point lower than that of the primary kerosine component prior to blending comprising combining more than 75% by volume of kerosine having a boiling range between 140°C to 250°C with a minor amount of a naphtha fraction produced by the catalytic cracking of heavy gas oil (HCCN) which naphtha has a boiling range of  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$  and an aromatic content of at least 50% by volume to produce a jet fuel blend of reduced freeze point and a total aromatic content in the range of 15-25% by volume of the total blend.

The Examiner rejects the claims under 35 U.S.C. § 103(a) as obvious over GB 735,134.

The Examiner argues that GB 735,134 discloses a process for producing a jet fuel comprising a kerosine fraction and a naphtha fraction. The naphtha fraction has a boiling point of from 280-350°F (138-177°C) while the kerosine fraction has a boiling point of from 330-550°F (167-287°C).

U.S. Serial No. 10/089,310  
Reply to Office Action of: August 10, 2004  
Family Number: P1999S008

Page 6

The Examiner argues that the aromatics rich naphtha fraction is incorporated directly into the jet fuel which has a total aromatics content of about 20-25 vol%, pointing to page 9, lines 85-89 and 108-111; page 10, lines 92-93 and Tables 1 and 4.

The Examiner concludes that it would be expected that the naphtha fraction contain at least 50 vol% of aromatics.

The Examiner goes on to argue that GB discloses that the kerosine fraction is the major component of the fuel while the naphtha comprises a minimum of 0.5 to 2 vol%.

The Examiner then argues that the GB reference discloses that the jet fuel has a freezing point of -76°F (-60°C) referring to page 3, lines 15-16.

Applicants respectfully traverse this rejection.

GB 735,134 teaches a very specific fuel composition with respect to the jet fuel aspect of its disclosure.

The jet fuel comprises kerosine and C<sub>8</sub>-C<sub>9</sub> aromatics, this particular jet fuel composition being marked by an ability to resist fuel filter plugging by ice crystals.

The text at page 3, columns 32-39, is specific in its recitation that it is the C<sub>8</sub>-C<sub>9</sub> aromatics that are particularly beneficial in the fuels.

The naphtha fraction is identified as that boiling in the 280-350°F (138-177°C) range. It must be noted from page 6, lines 20-29, that C<sub>8</sub> and C<sub>9</sub> aromatics are again identified, the highest boiling C<sub>8</sub> aromatics being ortho xylene (BP 291.95°F or about 144°C), the highest boiling C<sub>9</sub> aromatic being hemimellitene (BP 335°F or about 168°C).

U.S. Serial No. 10/089,310  
Reply to Office Action of: August 10, 2004  
Family Number: P1999S008

Page 7

Thus, the boiling range for the naphtha of between about 138-177°C is not arbitrary nor non-limiting or merely suggestive of other broader ranges.

When GB 735,134 recites a naphtha boiling range of 280-350°F (138-177°C), it means precisely this range.

Boiling range should not be confused with boiling point. A pure compound has a discrete boiling point. Mixture of compounds such as naphtha have boiling ranges. A naphtha defined as having a boiling range between  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$  is not the same material as a pure compound having a discrete boiling point nor is it the same as a mixture having a boiling range between 138-177°C, despite what appears to be an overlap.

The naphtha having a boiling range of  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$  defines a material at which at 165°C 5% of the material boils off and at 210°C 95% of the material boils off. This product boiling between  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$  defines the naphtha fraction used in the present invention.

This fraction is heavier than, and outside the range of material covered in GB 735,134 in its definition of  $\text{C}_8\text{-C}_9$  aromatics boiling in the range 280-350°F (i.e., 138-177°C), that is, a naphtha fraction having an end point temperature of 350°F (177°C).

A naphtha fraction having an end point of 177°C is much lighter and much different than a naphtha fraction boiling between  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$ , the end point being even a few degrees C higher than the  $T_{95} = 210^\circ\text{C}$  temperature.

Thus, the fractions are not the same despite the limited area of overlap. The recitation of a boiling range or an end point of 350°F does not teach, suggest or imply using or isolating a particular single molecule at a single temperature in the range but rather using a fraction boiling within the entire recited range. In the present invention the

U.S. Serial No. 10/089,310  
Reply to Office Action of: August 10, 2004  
Family Number: P1999S008

Page 8

naphtha fraction used is the whole fraction boiling between  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$ , whereas in the reference the aromatic are  $\text{C}_8\text{-C}_9$  aromatics or naphtha fraction having an end point of  $350^\circ\text{F}$  ( $\sim 177^\circ\text{C}$ ).

This teaching of a naphtha fraction having an end point of  $350^\circ\text{F}$  ( $\sim 177^\circ\text{C}$ ) does not teach, suggest or imply using a naphtha fraction having a  $T_{95}$  point of  $210^\circ\text{C}$ , nor, based on the teaching of the entire reference does it teach, suggest or imply that the freeze point of kerosine, the temperature at which wax crystallizes, can be lowered by adding such a  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$  naphtha fraction to such kerosine.

The recitation in the reference that it is an object of the reference invention to produce a jet fuel with a freeze point of  $-76^\circ\text{F}$  ( $-60^\circ\text{C}$ ) should not and cannot be read as a teaching that it is the addition of the  $\text{C}_8\text{-C}_9$  aromatics which achieves this freeze point. The  $-76^\circ\text{F}$  ( $-60^\circ\text{C}$ ) freeze point temperature is merely the repetition of the heretofore recited JP-1, JP-3 and JP-4 turbine fuel freezing point specification form Table 1.

In Table 1, the specification is for jet fuel of any type produced by any technique. The  $-76^\circ\text{F}$  freeze point specification in Table 1, therefore, is not a recitation that the jet fuel of the reference achieves that temperature by the addition of  $\text{C}_8\text{-C}_9$  aromatics, but is rather a recitation that regardless of how the fuel is finally prepared the fuel has to have or meet a freeze point spec of  $-76^\circ\text{F}$  ( $-60^\circ\text{C}$ ) or else be rejected as "off-spec".

The  $-76^\circ\text{F}$  temperature is just the government's military specification for the acceptable freeze point of jet fuel.

It is not specified in the Mil-Spec just how this is to be achieved. A freeze point of  $-76^\circ$  could be reached by use of approved wax crystal modifier/pour point/freeze point depressant additives such as those taught in EP-A-0282342, cited at page 1 of the present application.

U.S. Serial No. 10/089,310  
Reply to Office Action of: August 10, 2004  
Family Number: P1999S008

Page 9

The present reference, specifying that it reduces the ability of jet fuel to form ice crystals by the addition of  $C_8$ - $C_9$  aromatic (naphtha with an end point of 350°F (~ 177°C)) does not teach, suggest or imply that kerosine can have its wax crystal formation freeze point lowered by the addition thereto of a minor amount of a naphtha fraction produced by the catalytic cracking of heavy gas oil which naphtha fraction has a boiling range of  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$ .

The Examiner rejects claims 1, 3 and 4 over GB 735,134 arguing that although the reference does not disclose the claimed boiling ranges of the naphtha and kerosine fractions the reference discloses that the naphtha fraction has a "boiling point" of from 280°F to 350°F (138-177°C) and the kerosine has a "boiling point" of from 330-550°F (167-287°C).

The Examiner argues that it would have been obvious to utilize naphtha and kerosine fractions having the presently claimed ranges because "one of skill in the art would utilize any naphtha fraction having a boiling point of from 280-350°F (138-177°C) or kerosine fraction having a boiling point of from 330-550°F (167-287°C) including the overlapped claimed ranges with the expectation that any fraction having a boiling point within the ranges would give similar results".

Applicant respectfully traverses this rejection.

As previously indicated kerosine and naphtha are not discrete, pure, individual hydrocarbons but mixtures of hydrocarbons.

When discussing a hydrocarbon mixture one does not talk about boiling point but boiling range over which fractions are recovered, i.e., the fraction is identified in terms of the temperature range over which it is recovered, e.g.,  $T_5 = 165^\circ\text{C}$  to  $T_{95} = 210^\circ\text{C}$ . Such fractions have an initial boiling point, a temperature at which a first drop of material is recovered and a final boiling point, a temperature at which a last or final drop of material is recovered.

U.S. Serial No. 10/089,310  
Reply to Office Action of: August 10, 2004  
Family Number: P1999S008

Page 10

In the reference the kerosine is defined as a boiling between 330 to 550°F, that is the kerosine used in the reference is that fraction which is recovered with a first drop at 330°F and the last drop at 550°F. Those portions boiling below 330°F and above 550°F are excluded. Similarly, defining the naphtha as boiling between 280°F to 350°F (138-177°C) defines a naphtha fraction the first drop of which is recovered at 280°F and the last drop of which is recovered at 350°F. This entire fraction recovered at between 280°F to 350°F is the fraction used or suggested in the GB reference.

By comparison, in the present invention the naphtha fraction recovered and used is that fraction recovered at between  $T_5 = 165^{\circ}\text{C}$  and  $T_{95} = 210^{\circ}\text{C}$ . It is this entire fraction which is employed and it is this fraction which is different than the 138-177°C fraction of the reference.

The present invention does not seek to claim the use of a particular limited portion within the fraction boiling between  $T_5 = 165^{\circ}\text{C}$  and  $T_{95} = 210^{\circ}\text{C}$  but uses the entire fraction boiling between these limits.

The Examiner seems to be suggesting that the present invention is seeking to use only a particular portion within the fraction, the particular portion being that which has a specific boiling point somewhere between 168-177°C. This is not the case.

The reference by reciting a boiling range of 138-177°C is teaching an entirely different naphtha fraction than that of the present invention having a boiling range of from  $T_5 = 165^{\circ}\text{C}$  and  $T_{95} = 210^{\circ}\text{C}$ , and it is maintained that the boiling range in the reference does not teach, suggest, imply or embrace the naphtha of the boiling range taught in the present invention.

The Examiner rejects claim 2, now claim 4, arguing that the reference teaches jet fuel having a freeze point of less than -76°F.

U.S. Serial No. 10/089,310  
Reply to Office Action of: August 10, 2004  
Family Number: P1999S008

Page 11

This rejection has been addressed above and the arguments are adopted here without repetition.

The rejections of Claims 5, 6, 7 and 8, which claims are based on what are believed to be allowable claims, will not be addressed, the allowability of the main claim supporting the allowability of Claims 5 to 8.

It is believed new method claims 9-16 are not taught, suggested or implied by GB 735,134 for the same reasons that fuel composition claims 1-8 are not taught, suggested or implied by that reference as discussed above. The GB reference never prepared the present blend using the presently disclosed kerosine and naphtha fraction or measured its freeze point or suggested that the wax freeze point of kerosine based jet fuel could be reduced by addition to the kerosine of a quantity of the particular naphtha fraction recovered from the catalytic cracking of having gas oil which naphtha has a distillation range of  $T_5 = 165^{\circ}\text{C}$  and  $T_{95} = 210^{\circ}\text{C}$ .

It is requested that the Examiner reconsider this case in light of the amendments made to the claims and the above remarks, that he withdraw the rejections, allow the claims and pass the case to issue in due course.

Respectfully submitted,



Joseph J. Allouca

Attorney for Applicant

Registration No. 27,766

Telephone Number: (908) 730-3629

Facsimile Number: (908) 730-3649

☒ Pursuant to 37 CFR 1.34(a)

ExxonMobil Research and Engineering Company  
P. O. Box 900  
Annandale, New Jersey 08801-0900

JJA:kak (11/4/2004)